

10CFR50.73

September 15, 2005

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Limerick Generating Station, Unit 1  
Facility Operating License No. NPF-39  
NRC Docket No. 50-352

Subject: LER 1-05-003, Reactor Scram Due To Invalid Actuation Of  
Main Generator Lockout Relay

This Licensee Event Report (LER) addresses an automatic actuation of the reactor protection system when the reactor was critical. This event was due to an actuation of a main generator protection lockout relay that was caused by a degraded main generator output breaker position monitoring circuit and DC system grounds.

Report Number: 1-05-003  
Revision: 00  
Event Date: July 18, 2005  
Discovered Date: July 18, 2005  
Report Date: September 15, 2005

This LER is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv)(A).

If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

Original signed by Chris H. Mudrick for

Ron J. DeGregorio  
Vice President - Limerick  
Exelon Generation Company, LLC

cc: S. J. Collins, Administrator Region I, USNRC  
S. L. Hansell, USNRC Senior Resident Inspector, LGS

SUMMARY OF EXELON NUCLEAR COMMITMENTS  
LS-AA-117-1003 Rev.2

The following table identifies commitments made in this document.  
(Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

Commitment #1	Committed date (or "outage"): NA
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None

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollects@nrc.gov](mailto:infocollects@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

Limerick Generating Station, Unit 1

## 2. DOCKET NUMBER

05000352

## 3. PAGE

1 OF 5

## 4. TITLE

Scram Due To Invalid Actuation Of Main Generator Output Breaker Position Monitor Circuit

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
07	18	2005	2005	- 003 -	0	09	15	2005	FACILITY NAME	DOCKET NUMBER
										05000

## 9. OPERATING MODE

1

## 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)

- |   |   |  |   |
|---|---|--|---|
| <input type="checkbox"/> 20.2201(b)         | <input type="checkbox"/> 20.2203(a)(3)(i)   | <input type="checkbox"/> 50.73(a)(2)(i)(C)             | <input type="checkbox"/> 50.73(a)(2)(vii)     |
| <input type="checkbox"/> 20.2201(d)         | <input type="checkbox"/> 20.2203(a)(3)(ii)  | <input type="checkbox"/> 50.73(a)(2)(ii)(A)            | <input type="checkbox"/> 50.73(a)(2)(viii)(A) |
| <input type="checkbox"/> 20.2203(a)(1)      | <input type="checkbox"/> 20.2203(a)(4)      | <input type="checkbox"/> 50.73(a)(2)(ii)(B)            | <input type="checkbox"/> 50.73(a)(2)(viii)(B) |
| <input type="checkbox"/> 20.2203(a)(2)(i)   | <input type="checkbox"/> 50.36(c)(1)(i)(A)  | <input type="checkbox"/> 50.73(a)(2)(iii)              | <input type="checkbox"/> 50.73(a)(2)(ix)(A)   |
| <input type="checkbox"/> 20.2203(a)(2)(ii)  | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x)       |
| <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2)        | <input type="checkbox"/> 50.73(a)(2)(v)(A)             | <input type="checkbox"/> 73.71(a)(4)          |
| <input type="checkbox"/> 20.2203(a)(2)(iv)  | <input type="checkbox"/> 50.46(a)(3)(ii)    | <input type="checkbox"/> 50.73(a)(2)(v)(B)             | <input type="checkbox"/> 73.71(a)(5)          |
| <input type="checkbox"/> 20.2203(a)(2)(v)   | <input type="checkbox"/> 50.73(a)(2)(i)(A)  | <input type="checkbox"/> 50.73(a)(2)(v)(C)             | <input type="checkbox"/> OTHER                |
| <input type="checkbox"/> 20.2203(a)(2)(vi)  | <input type="checkbox"/> 50.73(a)(2)(i)(B)  | <input type="checkbox"/> 50.73(a)(2)(v)(D)             |   |

Specify in Abstract below  
or in NRC Form 366A

## 12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Robert E. Kreider, Manager – Regulatory Assurance

TELEPHONE NUMBER (include Area Code)

610-718-3400

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	IB	ANN	170E	Y					

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO15. EXPECTED  
SUBMISSION  
DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

A valid automatic actuation of the reactor protection system was initiated by a main turbine trip that was caused by an invalid main generator lockout relay actuation. A corroded disconnect position switch and concurrent ground on the balance of plant DC power distribution system adversely affected the main generator output breaker position monitoring circuit and caused the circuit to falsely sense that both main generator output breakers were open. The corroded switch and ground were repaired and the unit was restarted. Monitoring of the generator output breaker position monitoring circuit relays has been added to the operator rounds. Enhancements to the ground elimination processes, training and test equipment are planned.

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**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

Unit Conditions Prior to the Event

Unit 1 was in Operational Condition (OPCON) 1 (Power Operation) at approximately 100% power. There were no structures, systems or components out of service that contributed to this event.

Description of the Event

On Monday July 18, 2005 Limerick Unit 1 was operating at 100% power. At 09:50 hours an automatic actuation of the reactor protection system (RPS) occurred as a result of a turbine (EIIS:TRB) trip. The operators entered the trip procedure for reactor pressure vessel (RPV) control (T-101) and stabilized reactor parameters. The operators verified that all control rods were fully inserted.

Reactor level initially decreased to a minimum of -3 inches and increased to a maximum of +34 inches then stabilized at +20 inches during level recovery. The +54 inch high-level turbine trip setpoint was not exceeded. Reactor pressure initially increased from 1035 to approximately 1154 psig, which is less than the lowest safety relief valve (SRV) setpoint of 1170 psig; no SRVs actuated. Reactor pressure then decreased to 910 psig and stabilized at 955 psig. The main steam bypass valves opened as designed to control pressure.

The reactor recirculation pumps (EIIS:AD) tripped on end-of-cycle recirculation pump trip (EOC-RPT) as designed due to a turbine trip at greater than 30 percent power. The redundant reactivity control system (RRCS) anticipated transient without scram (ATWS) trip actuated after the EOC-RPT trip when reactor pressure exceeded the trip setpoint of 1149 psig.

The post-scrum investigation determined that generator lockout relay (EIIS:RLY) 386G-G101 had actuated. The 386G relay actuation was caused by an invalid actuation of the generator output breaker (EIIS:EL) position monitoring relays due to a DC ground. The 386G relay actuates if both Unit 1 generator output breakers (535 and 635) open. There were no relay targets present on any of the generator protection relays. This indicated an absence of a valid fault actuation signal to the generator lockout relays.

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**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

Immediately following the scram, I&C technicians were dispatched to monitor the temporary DC ground detection instrumentation that was installed to support in-progress DC ground troubleshooting. There was no active troubleshooting in progress at the time of the scram. While observing instrumentation, the technicians noted a spike in ground current, which was concurrent with a main control room (MCR) alarm (EIIS:ALM) actuation. A degraded alarm horn (EIIS:IB) was replaced.

To support restart, the main generator protective relays were tested to ensure the actuation targets were functioning properly.

All relay targets operated as designed. Digital fault recorder (DFR) traces did not indicate any fault currents confirming that generator protection relays did not actuate on a valid fault condition.

The generator output breaker position monitoring circuit is comprised of two redundant channels (X and Y). Each channel monitors the position of both generator output breakers (535 and 635) and the generator disconnect (11 DISC). If both generator output breakers trip with the disconnect closed, the channel inputs a trip signal into the generator protective relay logic. However, both channels must sense that both output breakers are tripped to actuate the 386G generator lockout relay.

Further investigation revealed corroded position switch (EIIS:33) contacts on the generator main disconnect (EIIS:FK). The investigation concluded that the X channel breaker position monitor circuit (relay 452X-1) was in a tripped condition prior to the scram due to the corroded disconnect position switch contacts. The investigation further concluded that the alarm horn ground combined with an existing ground to cause the 452Y-1 relay to change state and complete the generator lock-out logic.

The generator disconnects receive preventive maintenance. However, no preventive maintenance is performed on the generator disconnect position switch that was corroded. Maintenance records could not be located on this switch.

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**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

A 4-hour NRC ENS notification was required by 10CFR50.72(b)(2)(iv)(B) for an actuation of RPS when the reactor was critical. An 8-hour NRC ENS notification was required by 10CFR50.72(b)(3)(iv)(A) for a valid actuation of RPS. The ENS notification (#41848) was completed on Monday July 18, 2005 at 11:15 EDT. This event involved an automatic actuation of RPS. Therefore, this LER is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv)(A).

### Analysis of the Event

There were no actual safety consequences associated with this event. The potential safety consequences of this event were minimal. A turbine trip with bypass transient is categorized as an incident of moderate frequency per UFSAR section 15.2.3 Turbine Trip. The plant equipment performed as designed during the transient and the operators effectively stabilized reactor parameters.

The failure of the annunciator buzzer resulted in a low resistance positive ground on the DC distribution system (EIIS:EI) at the time of the event. A neutral ground was also present preceding the event. The resulting ground current caused a false actuation of a relay in the Y channel of the main generator output breaker position monitoring circuit. An additional pre-existing condition was a corroded disconnect position switch contact. This switch failure resulted in the X channel being in the tripped condition prior to the event. When the Y channel actuated the logic was completed for an actuation of the main generator lockout protective relay. This resulted in a main generator lockout, main turbine trip and subsequent reactor scram. A simplified computer model of the circuit was used to verify that the identified grounds had the potential to cause the invalid relay operation.

### Cause of the Event

The event was caused by concurrent positive and neutral grounds and a corroded disconnect position switch that caused a false actuation of the main generator output breaker position monitoring circuit. A root cause of the event was lack of preventive maintenance on the disconnect position switch contact. An additional root cause was less than adequate station ground fault location capability.

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**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

Corrective Action Completed

The corroded disconnect position switch was repaired.

The grounded annunciator horn was replaced.

Visual inspections of the generator output breaker position monitoring circuit auxiliary relays were added to the operator rounds.

The main generator output disconnect preventive maintenance activities have been revised to include an inspection of disconnect position switches.

Corrective Action Planned

Recommended improvements to the ground fault location panel and troubleshooting tools will be presented to the station Plant Health Committee. The presentation to the committee will be complete by November 28, 2005.

Previous Similar Occurrences

A Unit 2 scram was reported in LER 2-00-001 due to a troubleshooting activity on a balance-of-plant DC ground on a transformer alarm circuit.

Component data:

System: IB (Annunciator System)  
Component: ANN (Annunciator)  
Manufacturer: 170E (Edwards)  
Part#: 343A-P1